

WHAT I CLAIM AS MY INVENTION:

1. A breath alcohol detection device comprising:
 - A) a breath inlet passage having an inlet port;
 - B) a pressure sensor in communication with the breath inlet passage to generate a pressure signal responsive to the pressure in the breath inlet passage;
 - C) a fuel cell;
 - D) a vent passage communicating the breath inlet passage to atmosphere;
 - E) a two position valve having a valve inlet in communication with the breath inlet passage, a first outlet, a second outlet, and an operator to shift the valve from a first position where the valve connects the valve inlet to the first valve outlet and a second position where the valve connects the valve inlet to the second valve outlet;
 - F) a first passage communicating the first valve outlet to atmosphere, and a first restriction in such passage;
 - G) a second passage communicating the second valve outlet to atmosphere through the fuel cell, and a second restriction in such second passage, said first restriction generally equaling said second restriction; and
 - H) an actuator for shifting the valve from the first position to the second position for an interval to flow a volume of breath from the breath inlet passage through the valve, through the second passage and into the fuel cell to generate a fuel cell output signal proportional to the alcohol contained in the sample,

wherein shifting of the valve between the first and second positions does not substantially vary the pressure in the breath inlet passage.

2. The breath alcohol detection device as in claim 1 wherein said vent passage has a flow area larger than the flow area of the first restriction.

3. The breath alcohol detection device as in claim 2 wherein the flow area of said first restriction is about 7.3 percent of the flow area of the vent passage.

4. The breath alcohol detection device as in claim 3 wherein the flow area of the first restriction is about 0.00038 square inches and the flow area of the vent passage is about 0.0052 square inches.

5. The breath alcohol detection device as in claim 1 including a body, said passages located in said body, a vent recess in the body, said vent passage and first passage opening in said vent recess, and said second passage opening away from said vent recess.

6. The breath alcohol detection device as in claim 5 including a cover on the body, the cover overlying the vent recess, and one or more vent openings in the cover located over the vent recess.

7. A breath alcohol detection device comprising:

- A) a breath inlet passage having an inlet port;
- B) a pressure sensor in communication with the breath inlet passage to generate a pressure signal in response to the

pressure in the breath inlet passage, said sensor including pressure sensor leads;

C) a fuel cell having fuel cell leads;

D) a valve disposed between the breath inlet passage and the fuel cell, the valve having a closed position to prevent flow of breath from the breath inlet passage to the fuel cell and an open position to permit flow of breath from the breath inlet passage to the fuel cell, an operator for shifting the valve between said positions, and valve leads for actuation of the operator; and

E) a computing device connected to said pressure sensor leads, said fuel cell leads and said valve leads, said computing device including first means operable for determining the length of a valve open time interval based on the pressure in the breath test passage when the valve is closed; for actuating said valve operator after determining the interval to open the valve for the said interval and permit flow of breath from the breath inlet passage through the valve and into the fuel cell during the interval so that the fuel cell generates a fuel cell voltage output signal proportional to the amount of alcohol in the breath flowed into the fuel cell during the interval; for closing the valve after the end of the interval; and for calculating the BrAC of the person flowing the breath sample through the device based on the voltage output signal.

8. The breath alcohol detection device as in claim 7 wherein the fuel cell has an internal flow resistance and including a

passage extending from the valve to atmosphere when the valve is closed to prevent flow to the fuel cell, a first flow resistance in such passage between the valve and atmosphere, wherein the fuel cell flow resistance and the first flow resistance are substantially equal.

9. The breath alcohol detection device as in claim 8 wherein the flow area of the first flow resistance is smaller than the flow area of the vent passage.

10. The breath alcohol detection device as in claim 7 including a vehicular interlock, said computer device including second means for locking the interlock to prevent starting of a vehicle engine when the BrAC is equal or greater than a legal limit and for opening the interlock and permitting starting of the vehicle engine when the BrAC is less than the limit.

11. The breath alcohol detection device as in claim 7 including a one-piece body having an outer surface, said body defining said passages; recesses in the outer surface of said body, said pressure sensor, said fuel cell and said valve each located in a recess; and a cover closely surrounding the body and said pressure sensor, fuel cell and valve.

12. The breath alcohol detection device as in claim 11 including a vent recess in the body, said vent passage opening into said recess, said cover overlying said recess, vent openings in the cover; and an outlet passage in the body extending from the fuel cell to the surface of the body at a location away from the vent recess.

13. The breath alcohol detection device as in claim 12 wherein said body is a block.

14. The breath alcohol detection device as in claim 13 wherein said body is integral.

15. The breath alcohol detection device as in claim 7 wherein said body is formed from a single piece of a plastic material.

16. A breath alcohol detection device including a body having an exterior surface; a plurality of recesses formed in the body surface including a pressure sensor recess, a valve recess, a fuel cell recess and a vent recess; a pressure sensor in the pressure sensor recess; a two position valve in the valve recess; a fuel cell in the fuel cell recess; a breath inlet passage in the body having an inlet port at the body surface; a vent passage in the body extending from the breath inlet passage to the vent recess; said valve having an inlet and first and second outlets, the valve inlet in communication with the breath inlet passage; a first passage in the body extending from a first valve outlet to the fuel cell; a second passage in the body extending from the second valve outlet to the vent recess; each of said pressure sensor, valve and fuel cell including electrical leads, all of said leads extending away from said body.

17. The breath alcohol detection device as in claim 16 wherein said pressure sensor, valve and fuel cell are located substantially at or below the surface of the body.

18. The breath alcohol detection device as in claim 16 including a cover surrounding said body, said cover overlying said

vent recess, and including vent openings in said cover over such recess.

19. The breath alcohol detection device as in claim 18 including a third passage in the body, said third passage extending from the fuel cell to the surface of the body away from the vent recess.

20. The breath alcohol detection device as in claim 18 wherein said body comprises a block and is formed from a plastic material.

21. The breath alcohol detection device as in claim 18 wherein said body includes a number of faces, said pressure sensor, valve and fuel cell located in said body substantially below said faces.

22. The breath alcohol detection device as in claim 16 including a temperature sensor located in said breath inlet passage, said pressure sensor including leads extending through said body and away from said body.

23. The method of determining the BrAC of a prospective operator of a motor vehicle using a breath alcohol detection device having a breath inlet passage, a pressure sensor, a valve, a fuel cell and a computer system, comprising the steps:

A) flowing breath from the prospective operator into the breath inlet passage while maintaining the valve closed;

B) determining the pressure of the breath in the breath inlet passage while the valve is closed;

C) calculating a valve-open interval based on the pressure of the breath in the breath inlet passage while the valve is closed;

D) after calculating the valve open interval opening the valve for a period of time equal to the interval, flowing breath from the breath inlet tube into the fuel cell during the valve open period of time and then closing the valve at the end of the valve open period of time;

E) consuming alcohol contained in the breath flowed into the fuel cell and generating a fuel cell voltage output signal;

F) and calculating the BrAC of the prospective operator based on the voltage output signal.

24. The method of claim 35 including the step of:

G) maintaining the pressure in the breath inlet passage substantially constant during calculation of the valve open interval and during the valve open period.